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of its own points as a centre, is equivalent to the circle which has the former line for radius.

Let OC be named R. Take $OD=2R$, $OC'=lR$, $BC'=C'B'=\frac{R}{l}$.

Now $BA=\sqrt{EB.\ BB'}=\sqrt{\left(lR+\frac{R}{l}+lR-\frac{R}{l}\right)\frac{2R}{l}}=2R=OA'$ and

$$OC : OC'=BC' : OC=BB' : OD.$$

Circum. OC : Circum. $OC'=BB' : OD$.

$\therefore$ OD. Circum. $OC=BB'$.Circum. OC'. Circle OA'=annule BA.

THE NEBULAR HYPOTHESIS.

By REV. A. L. GRIDLEY, Pastor of Congregational Church, Kidder, Missouri.

About twenty-five years ago while the writer of this atricle was a student in college, in speaking of the Nebular Hypothesis he told the Professor of mathematics that he believed that the impossibility of the said hypothesis could be proved by mathematics. He believed that the contraction could not have proceeded in such a way as to produce the necessary velocities at various times to perpetuate a revolution around the center.

With this belief he began work but had not proceeded far before he found that so far from disproving the possibility of the hypothesis he had discovered a clue by which he could estimate within very narrow limits the necessary rate of contraction from the orbit of one planet to that of another.

He would now venture nothing as to the truth of the hypothesis but if it be a true one,and the Solar Systen has evolved from a former nebulous mass, the time necessarily occupied in forming the liquid globes now constituting the planets of our system can be closely calculated.

In compliance with repeated requests from one of the editors of the "Journal" the calculations are here given.

The law may be briefly stated as follows: *The orbital velocity of any interior planet is the resultant of the orbital velocity of the next exterior planet and the contracting force.* For example the orbital velocity of Jupiter is greater than that of its exterior planet Saturn. Its velocity is the resultant of the velocity of rotation when the mass reached to Saturn and of the contracting force from that point to the present orbit of Jupiter. We have then the resultant of two forces and one of the forces to find the other and any one familiar with mechanics would give the rule: *From the square of the resultant subtract the square of the known force and the square root of the remainder will be the required force.*

Applying this rule we ascertain the rate of contraction from one orbit to another. Let $N=$ orbital velocity of Neptune, $U=$ that of Uranus, $D=$ the distance between the orbits, $T=$ the time of contraction from one orbit to the other. Then $T=\frac{D}{(U^2-N^2)}$.

Substituting for D, U and N, their known values and T in this case $=4156$ sidereal terrestrial days.

By the same process we find the time from Uranus to Saturn to be 244 such days, from Saturn to Jupiter to be 85 days. Passing to the minor planets, the time from Mars to the earth $=26$ days, Earth to Venus $=26.4$ days Venus to Mercury 17.7 days.

Of course these computations are confined to the conditions after the nebula had contracted to the limits of the present system.

By comparing the velocity of Neptune with the velocity of a body falling from infinite space probably a limit could be set beyond which the nebula could not have extended. But the original velocity of rotation cannot be ascertained by any known circumstance although it would be rash to speak positively even upon that point.

Minor circumstances not here taken into consideration might to a limited extent, affect the results just given, but upon the whole, the law would probably be subject to as little variation as Kepler's Third Law.

The radiation of heat from the mass would have been so rapid that contraction could not have proceeded steadily from Neptune to the sun and the mass broke into two pieces where the asteroids now are and these small planets are the "splinters" resulting from the separation. Thus some of the interior planets and Jupiter were forming contemporaneously.

The velocity of axial rotation of the planets depends upon the thickness of the rings deposited and of course size of the planet depends upon the same circumstance and so the larger the planet the greater the rate of axial rotation. This circumstance accounts for "Kirkwood's Law."

From the velocity of axial rotation and the distance of the satellites from the primary planets the minimum thickness, at least, of the rings can be approximately ascertained.

By following out the clues here given many things may be learned more curious than useful perhaps,but interesting from a scientific standpoint,if we admit the truth of the hypothesis.